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# D0 Operations

Linda Stutte

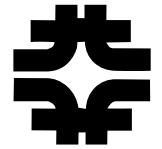
Fermilab

March 30, 2005

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# Organization

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- Experiment-based organization
- D0 Department has a substantial role
  - Operations budget
  - Visitor's budget
  - Run IIb project management
  - Buildings/space
  - Safety line management
- 33 physicists (8 RAs) and 10 Computing Pros
  - Detector, Online
  - Run IIb
  - Algo/ID
  - PC support

# D0 Experiment Department

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## DZero Experiment Department

April 2005

Linda Stutte, Department Head  
(Gene Fisk, Deputy Department Head)  
Ron Lipton, Deputy Department Head

Marvin Johnson, Associate Head - Run IIb  
Boaz Klima, Associate Head - Physics Support  
John Womersley (L)

### Run IIb Project

Vivian O'Dell, Project Manager  
(Ron Lipton, Deputy Project Manager)  
(Marvin Johnson, Technical Coordinator)  
(T.J. Sarlina, Assistant Project Manager)  
(Dale Knapp, Budget Officer)

### Physics Support Group

(Boaz Klima, Ldr.)  
Sergey Burdin, RA  
Richard Cantal  
Greg Cisko  
Shaohua Fu, RA  
Herbert Greenlee  
Kazunori Hanagaki, WF  
Alan Jonckheere  
Aurelio Juste, WF  
Yurii Maravin, RA  
Martijn Mulders, RA  
Ed Podschweit  
Makoto Tomoto, RA  
Michael Wang, RA  
Michael Weber, RA  
Markus Wobisch, RA

### Administrative Support

(Terry Erickson)  
(Harvey Bruch)  
(Sonya Wright)

### Run IIb Group

(Marvin Johnson, Ldr.)  
Robert Angstadt  
William Cooper  
Stefan Gruenendahl  
Andrei Nomerotski

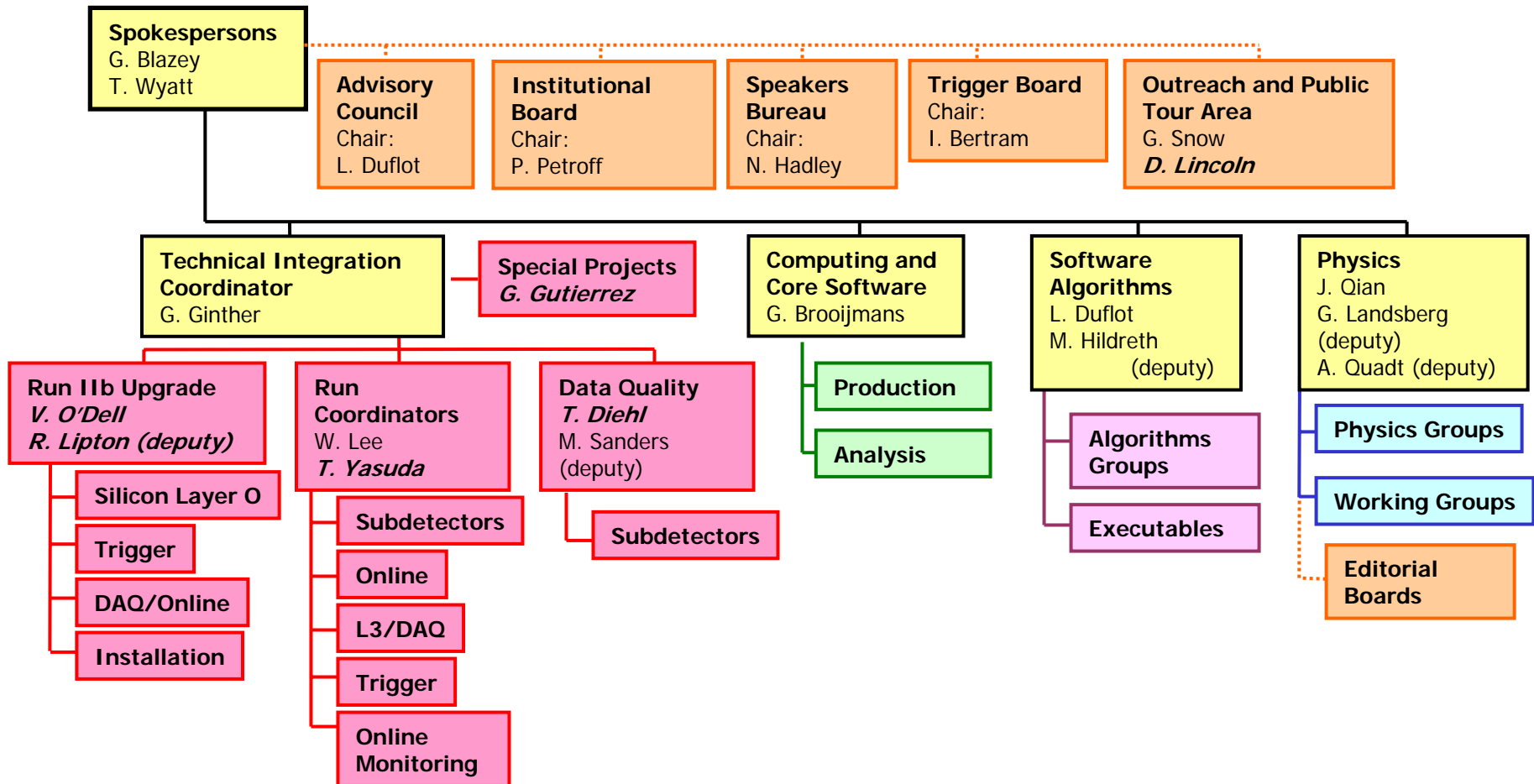
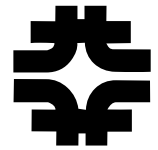
### Detector Group

(Ron Lipton, Ldr.)  
Alan Bross  
Dmitri Denisov  
Thomas Diehl  
Gaston Gutierrez  
Albert Ito  
Penelope Kasper  
Donald Lincoln  
Petros Rapisdis  
Richard Smith

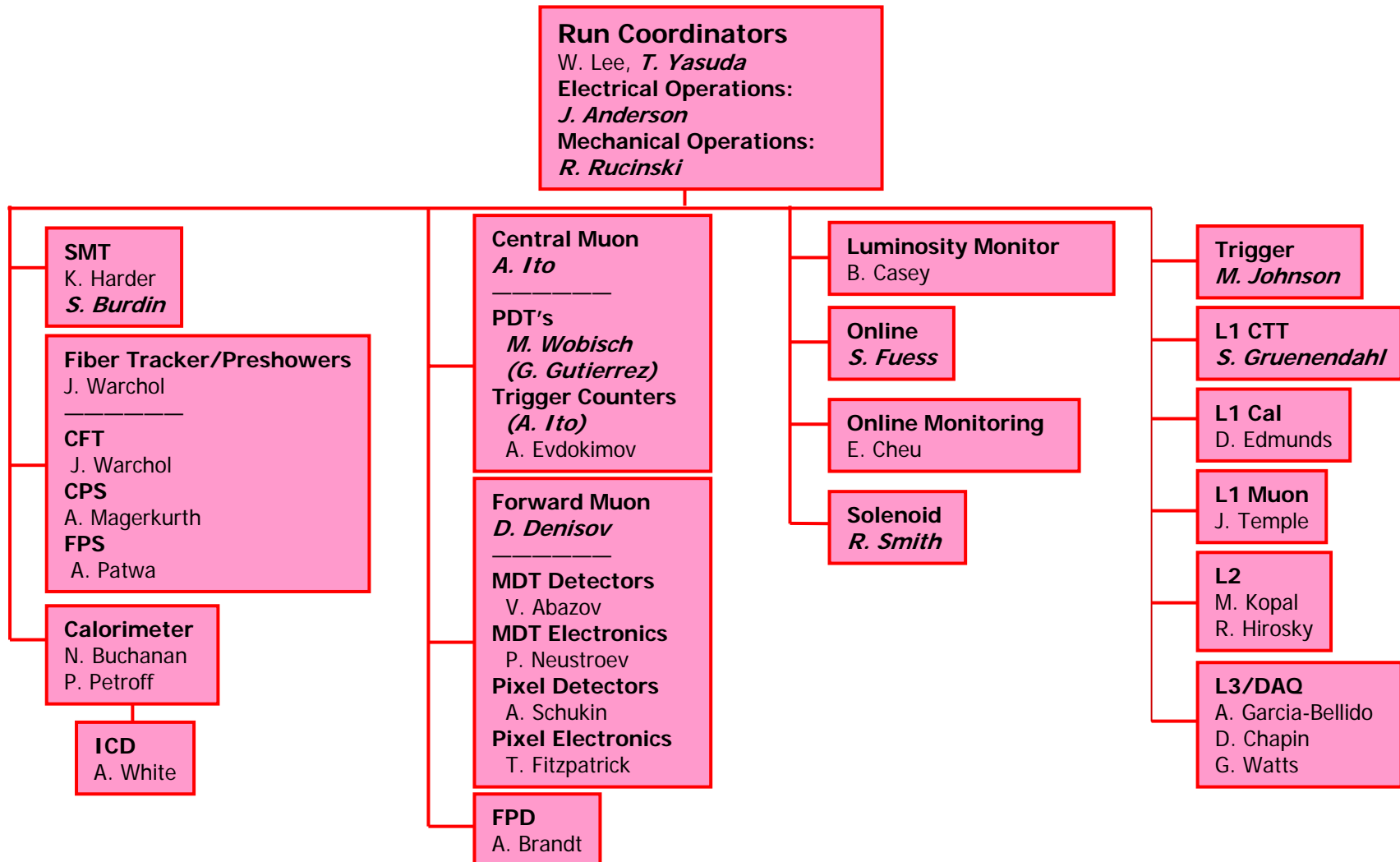
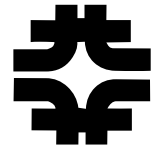
### Online Group

Stuart Fuess, Ldr.  
J. Frederick Bartlett  
James Fitzmaurice  
Stanislaw Krzywdzinski  
Nobuaki Oshima  
Geoffrey Savage  
Vladimir Sirotenko  
Takahiro Yasuda

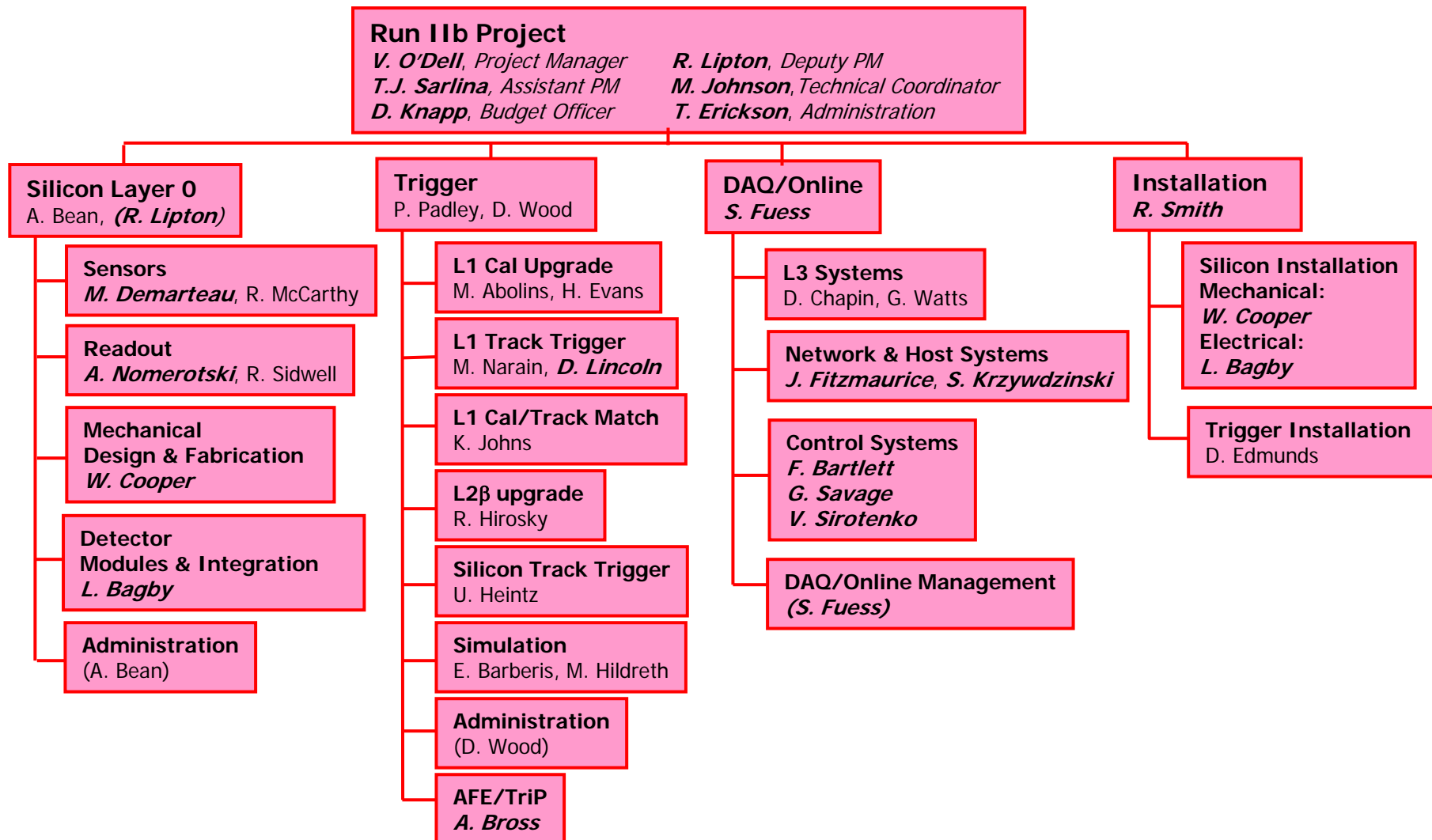
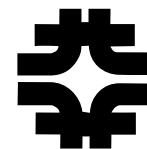
# D0 Organization



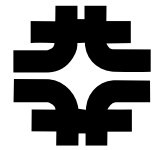
# D0 Detector



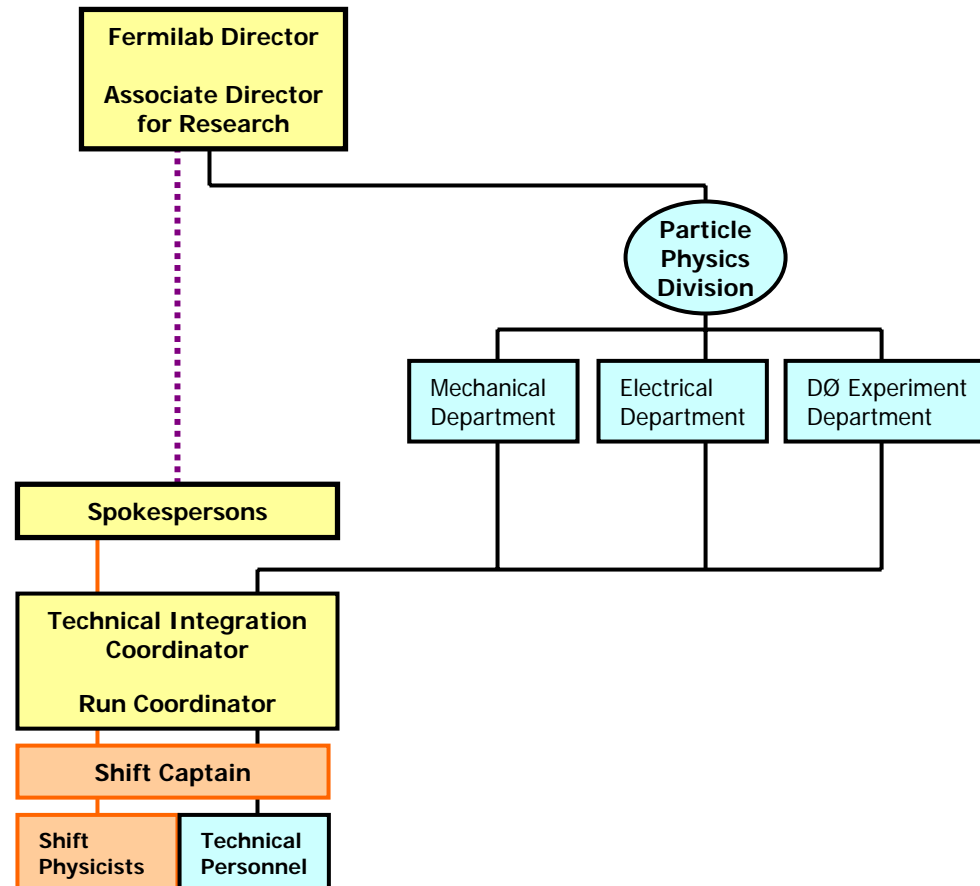
# D0 Run IIb



# D0 Experiment



## ES&H Organization Chart for D0 Operations Plan



# D0 Budget Summary



		<b>FY04 ACTUAL BASE</b>	<b>FY05 BUDGET</b>	<b>FY06 PBR</b>	<b>FY07 FLAT TO PBR</b>	<b>FY08 FLAT</b>	<b>FY09 FLAT</b>
<b>Total \$</b>							
<b>1.2.2</b>	<b>DZero</b>	<b>11,130.7</b>	<b>10,997.5</b>	<b>9,253.6</b>	<b>9,087.7</b>	<b>8,812.6</b>	<b>8,862.9</b>
<b>1.2.2.1</b>	<b>DZero Operations</b>	<b>8,372.1</b>	<b>8,782.8</b>	<b>8,858.6</b>	<b>9,061.1</b>	<b>8,812.6</b>	<b>8,862.9</b>
<b>1.2.2.4</b>	<b>DZero Run IIb</b>	<b>2,758.6</b>	<b>2,214.7</b>	<b>395.0</b>	<b>26.6</b>	<b>0.0</b>	<b>0.0</b>
<b>M&amp;S</b>							
<b>1.2.2</b>	<b>DZero</b>	<b>3,245.2</b>	<b>2,625.0</b>	<b>1,600.8</b>	<b>1,585.8</b>	<b>1,335.8</b>	<b>1,335.8</b>
<b>1.2.2.1</b>	<b>DZero Operations</b>	<b>1,719.1</b>	<b>1,576.0</b>	<b>1,600.8</b>	<b>1,585.8</b>	<b>1,335.8</b>	<b>1,335.8</b>
<b>1.2.2.4</b>	<b>DZero Run IIb</b>	<b>1,526.1</b>	<b>1,049.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>
<b>FTEs</b>							
<b>1.2.2</b>	<b>DZero</b>	<b>86.4</b>	<b>88.1</b>	<b>77.2</b>	<b>72.7</b>	<b>69.5</b>	<b>67.1</b>
<b>1.2.2.1</b>	<b>DZero Operations</b>	<b>72.9</b>	<b>75.8</b>	<b>73.3</b>	<b>72.4</b>	<b>69.5</b>	<b>67.1</b>
<b>1.2.2.4</b>	<b>DZero Run IIb</b>	<b>13.5</b>	<b>12.3</b>	<b>4</b>	<b>0.3</b>	<b>0</b>	<b>0</b>

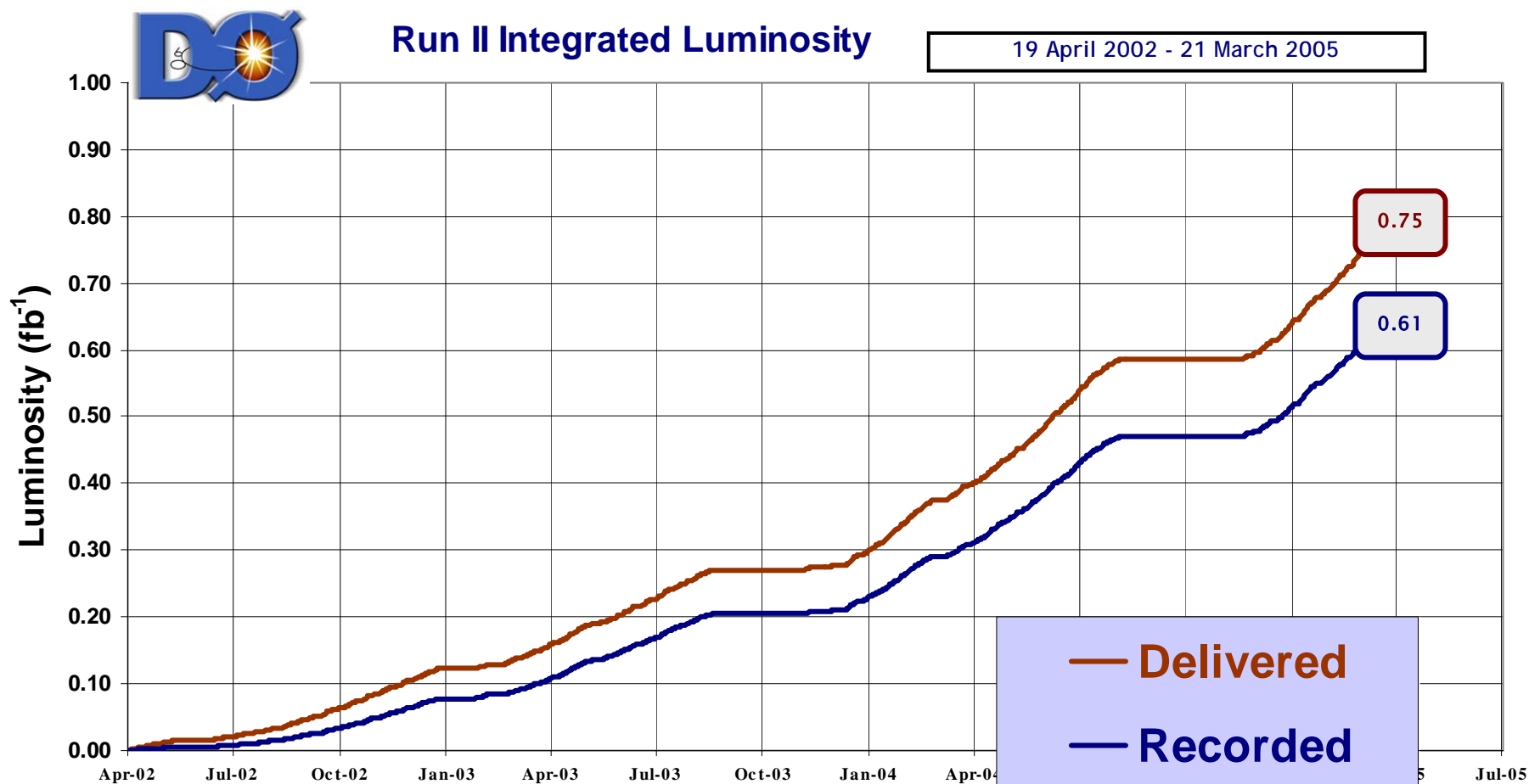
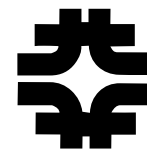


# D0 Operating Budget

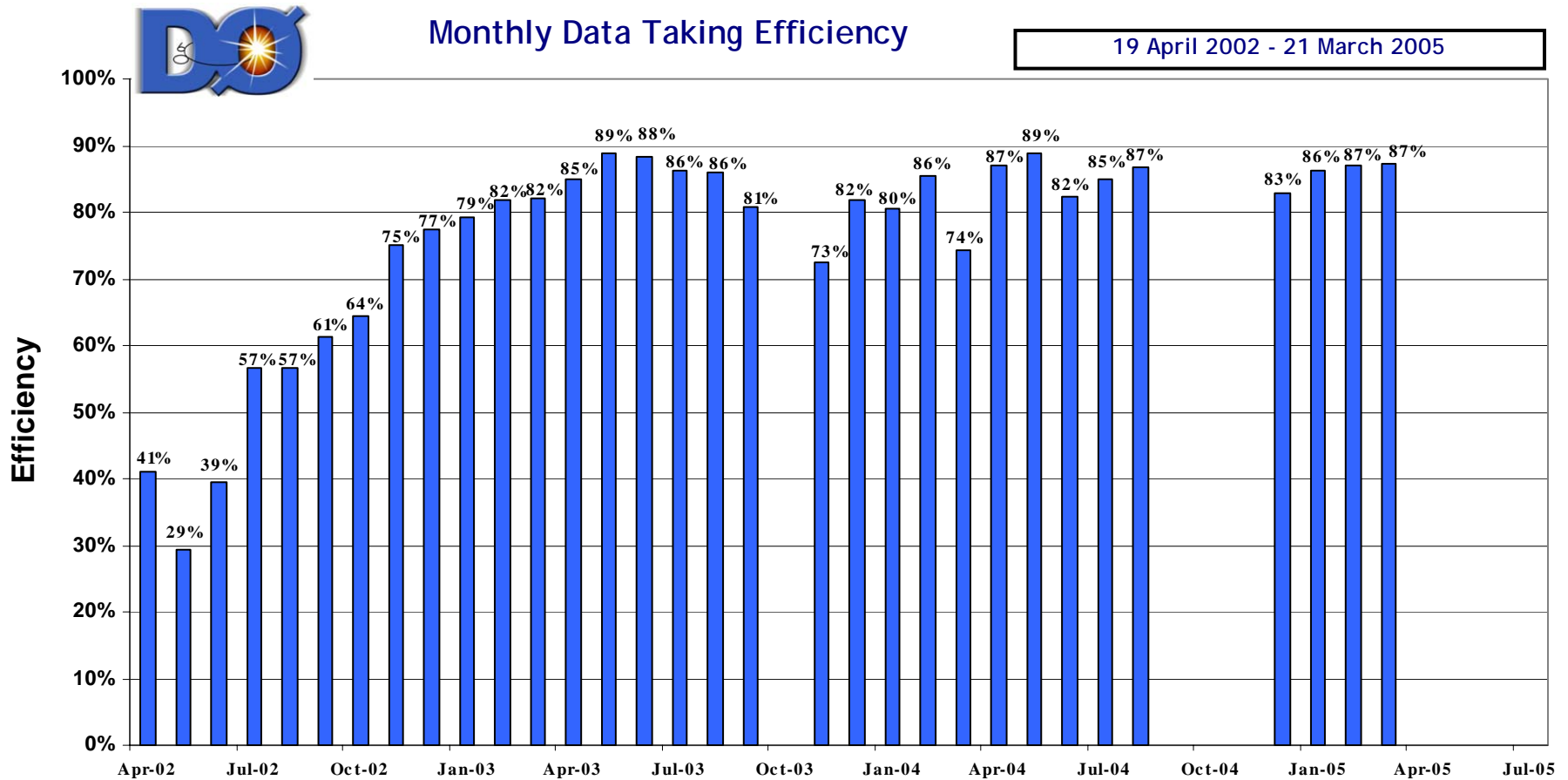
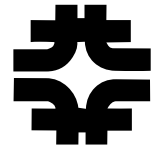


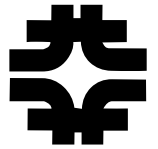
Material and Services	FY04 Plan	FY04 Spending	FY05 Plan
Management Reserve	25	1	0
Experiment Operations, Infrastructure	509	500	448
Computing General Operating	5	3	5
Cryogenic System	283	303	276
Building Operations	155	104	75
Mechanical Support	21	37	27
Electrical Support	40	52	60
Safety	5	1	5
D0 Run IIA Sub-Detector Operations	631	522	543
Tracking Detectors	72	175	127
Calorimetry	35	1	15
Muon System	199	180	190
Trigger	139	-49	111
Online Computing	186	215	101
Scientific Research	290	315	335
D0 Department Support	60	118	100
Office Support	125	100	120
Video Conferencing	50	24	25
Physics Support/Desktop Computing	55	72	55
General Operating (Experiment Support)	30	32	35
D0 Operating Total	1,455	1338	1,326

# D0 Run II Integrated Luminosity



# D0 Monthly Efficiency





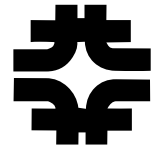
# Sources of Inefficiency

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- 4% - Front End Busy
- 2% - Begin/end store; Begin/end runs
- 4-8% - Failures
  - Power supply trips
  - Water drips/trips
  - Broken wires
  - Crate resets due to lost synch
  - Magnet-induced noise, power outages
- Shifter and Expert turnover
- Summarized at D0 Operations and All Exptr's

# Collaboration Support

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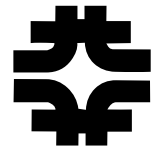
18 Physicists on shift/day

On-call experts carry & respond to pagers 24/7 to minimize downtime

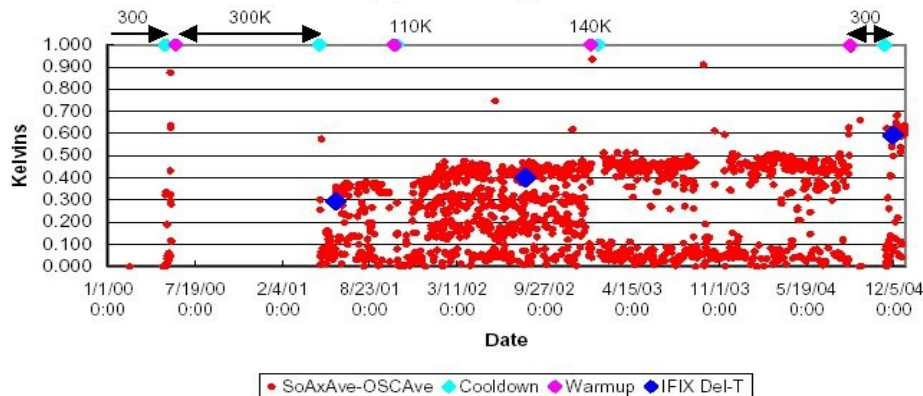
Current MOUs in place until Fall 2005.

Effort reporting currently underway. 485 individuals reported, with final institutional responses expected shortly. MOU updates to follow.

# D0 Solenoid



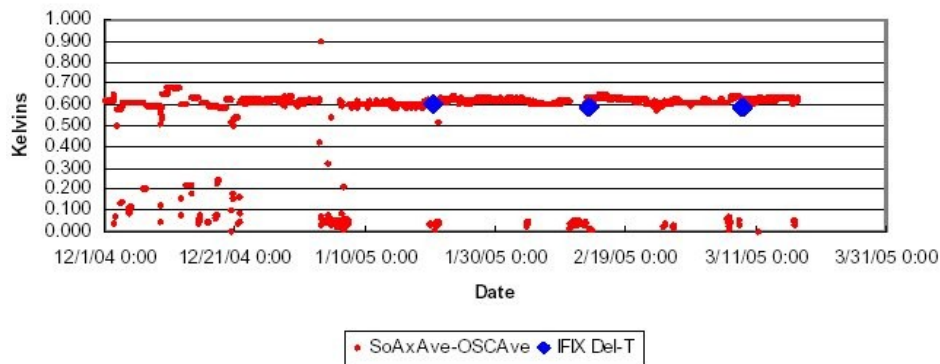
South Axial Support Temperature Elevation



Solenoid quenched when ramped to full field at the end of the 04 shutdown.  
-> runs stably @ 96% of design (4550/4750A)

Inner-layer conductor joint at S end of the magnet is degraded & generating a voltage drop -> ohmic heating.  
Degradation occurred over time & is strongly coupled to thermal cycling of the magnet.

South Axial Support Temperature Elevation



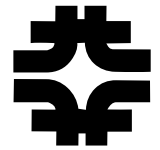
**Do not warm above 90K in future.**

**Minimize mechanical cycling of current.**

**Provide additional operating headroom by adding an additional cold compressor ~0.1K (550 A) – April 05 (AD)**

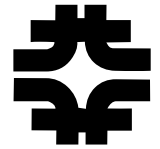
# Mitigating Operating Risks

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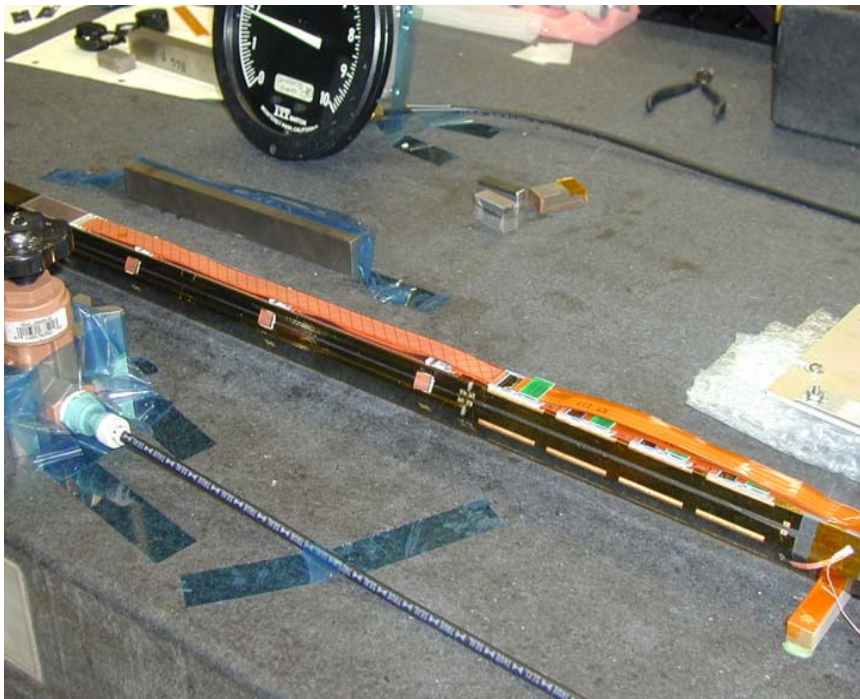


- Continue to recruit & train experts and shifters to minimize downtime
- Continue to monitor potential problems and improve automated monitoring to provide early warnings
- Radiation damage
  - Non-reversible, sometimes un-predictable
  - Continued monitoring is critical to detect and resolve problems before physics performance is degraded
- Other possible issues being monitored
  - Solenoid heat load stability
  - CFT cassette response due to cryo contamination (~2%)
  - Disabled readout channels in silicon (~17%)
- Experts always on call, Cryo OPS shifter 24/7
- The challenge of increasing luminosity.....

# Silicon Layer 0



- Will mitigate tracking losses due to radiation damage to the inner layer of SMT detector
- Improved IP resolution, especially for low  $p_t$



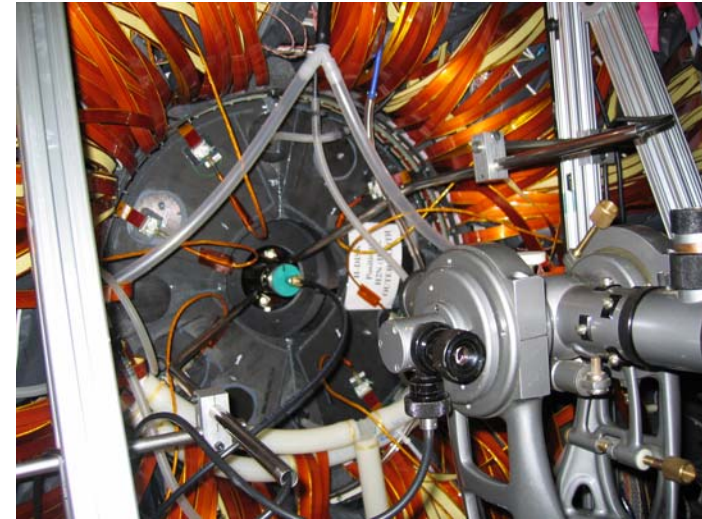
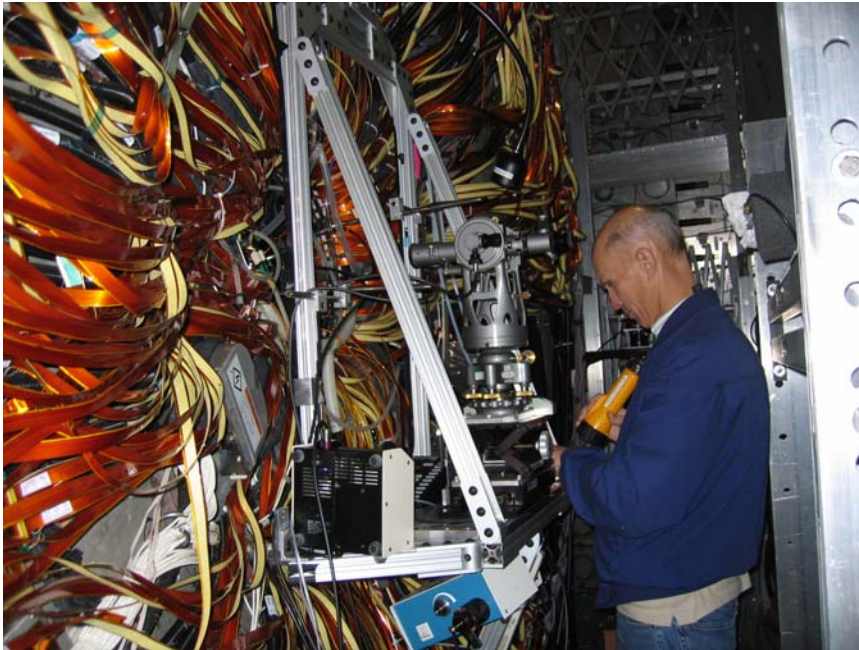
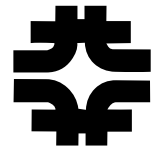
L0 modules installed on a prototype support structure since Nov 04.

Final modules now being assembled at SiDet.

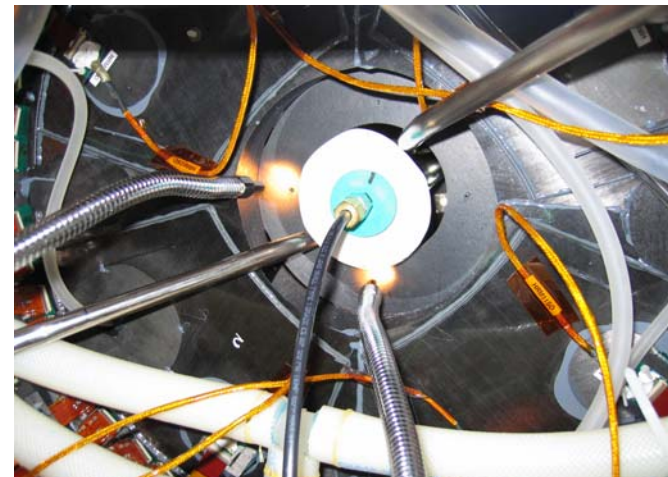
Installation fixturing is a pacing item.



# Aperture Measurements '04

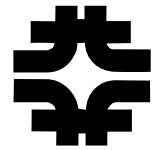


Beam pipes were decoupled for access.  
H-disks remained in place.  
Measurements show that Layer 0 will fit inside  
the current silicon detector.  
Also learned a lot about the installation  
procedure.



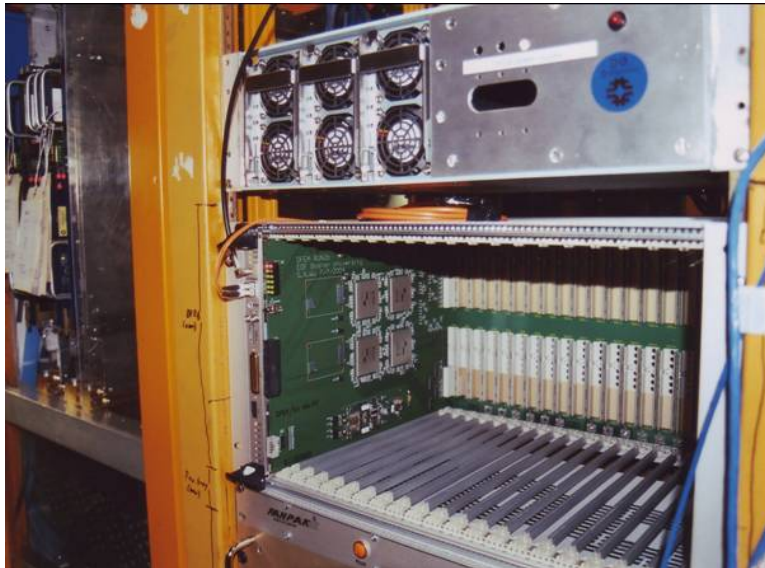
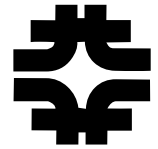
# Run IIb Trigger Upgrade

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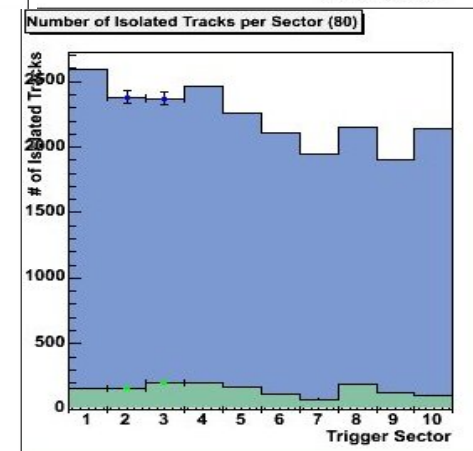
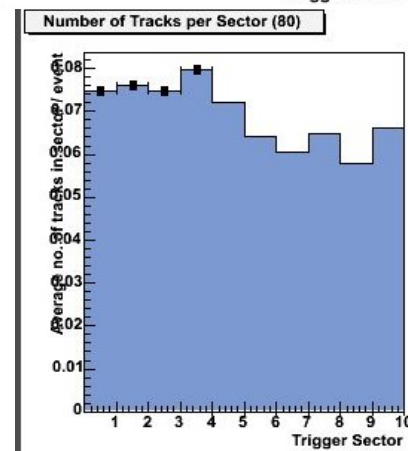
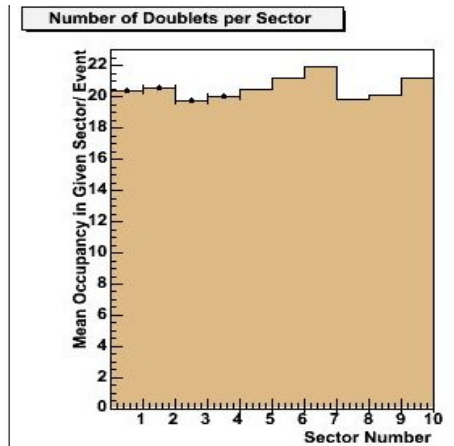
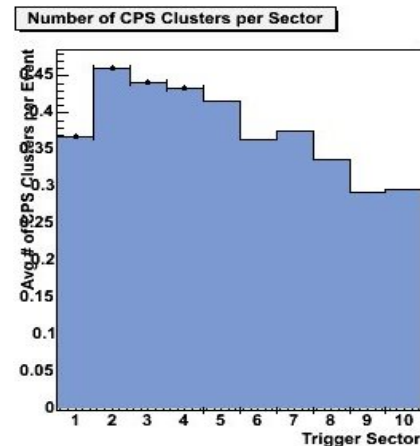


- Calorimeter trigger upgrade (L1)
  - Sharpens trigger turn-on thresholds
  - Improves object ID to facilitate triggering at higher luminosities – fake EM rejection
- Tracking trigger upgrade (L1)
  - Improved tracking rejection, especially at higher luminosities.
- L2 processor upgrades for more complex algorithms
- Silicon track trigger expansion – adding L0 inputs
- *All boards in production –  
many completed/tested*

# L1 CTT System tests

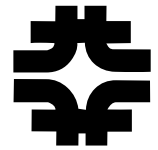


L1 CTT: Comparing Run IIa trigger output with Run IIb trigger output.



# Ensuring a smooth Upgrade Installation....

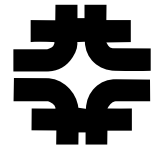
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- Layer 0 installation mock-up should identify most problems prior to actual installation
- Trigger system upgrade infrastructure in place (L1CTT) /sidewalk test area functional with integration/testing plans well advanced (L1Cal)
- Management planning continuously being refined – resource loaded schedule, contingency plan, critical path and hazard analyses

# D0 Operations Summary

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- D0 is operating well.
- Data taking efficiency is consistently in the high 80%'s.
- The coming year will be a challenging one with the Run IIb upgrades, but good planning will see us through!
- Flat budget projections through the end of Run II will require throttling spares purchases in the out years, and may limit the Fermilab FTE contribution to Operations